WATERSHED MANAGEMENT AREA 1

UPPER DELAWARE RIVER

The watershed management area includes watersheds draining the northwestern corner of New Jersey. The Area is comprised of Sussex and Warren Counties and includes the following watersheds:

Flat Brook	Paulins Kill	Pequest River
Pohatcong Creek	Shimmers Brook	Musconetcong River
VanCampens Brook		

Summary of ambient physical/chemical monitoring stations and classifications:

Flat Brook near Flatbrookville	FW-2 Trout Maintenance
Paulins Kill at Balesville	FW-2 Trout Maintenance
Paulins Kill at Blairstown	FW-2 Trout Maintenance
Pequest River at Pequest	FW-2 Non-Trout
Pohatcong Creek at New Village	FW-2 Trout Maintenance
Musconetcong River at Beattystown	FW-2 Trout Maintenance
Musconetcong River Bloomsbury	FW-2 Trout Maintenance
Musconetcong River Riegelsville	FW-2 Trout Maintenance

Note: Musconetcong River monitoring locations at Lake Hopatcong and at Lockwood have been discontinued as of 1991.

OVERALL MANAGEMENT AREA ASSESSMENT

- Swimmable Support Status:

WATERWAY	LOCATION	STATUS
Flat Brook	near Flatbrookville	Full Support
Paulins Kill	at Balesville	No Support
Paulins Kill	at Blairstown	Partial Support
Pequest River	at Pequest	Partial Support
Pohatcong Creek	at New Village	No Support
Musconetcong River	at Beattystown	Partial Support
Musconetcong River	Bloomsbury	No Support
Musconetcong River	Riegelsville	No Support

- Summary of Aquatic Life Support Status (Number of stations within each assessment category). Note: See the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed management area.

No Impairment: 52 Mod. Impairment: 20 Severe Impairment: 1

MAPS Here

FLAT BROOK

WATERSHED DESCRIPTION

The area drained by the Little Flat Brook, the Big Flat Brook (15 miles long) and the Flat Brook (10 miles long) is 65 square miles. This brook runs along the western boundary of Sussex County into the Delaware River 1.5 miles downstream of Flatbrookville. There are no major population centers, as most of this area is undeveloped mountainous forests contained within state parks, state forests, and the Delaware Water Gap National Recreation Area.

There are many lakes and ponds to accommodate bathing beaches and recreational fishery resources. There are very few point sources in the watershed. The Flat Brook and its tributaries are classified for the most part as FW-1 and FW-2 Trout Maintenance. There are also FW-2 Trout Production and Nontrout waters in the region.

WATER QUALITY ASSESSMENT

The Flat Brook and tributaries continue to contain among the highest quality surface waters in the state. Much of the Flat Brook watershed lies within state park and forest boundaries, thereby affording the streams protection from development. Monitoring is conducted on the Flat Brook near Flatbrookville, which represents most of the 10 mile stretch of the Flat Brook. Because of the relative stability of the water quality at this location, monitoring frequency has been reduced to half the frequency of other locations beginning in 1992; this station is sampled 5 times a year on alternating years. Because of this, the assessment of physical/chemical conditions presented here for the Flat Brook station is based upon a limited number of data points and is therefore presented in a more descriptive fashion than are the other monitoring locations presented in this Management Area.

Monitoring indicates water quality is still good. Periodic summertime problems may still occur because of elevated stream temperature for the protection of cold water fisheries. Dissolved oxygen, fecal coliform and nutrients were all within appropriate State criteria throughout the period of review.

Overall improvements in Flat Brook water quality had been identified between 1977 and 1987. This improvement was reflected in increases in dissolved oxygen as well as decreases in nitrogen-containing compounds and total mercury. The department is currently supporting an assessment of trends within the 1990s in order to evaluate current conditions.

Biomonitoring within the Flatbrook, Little Flatbrook and Big Flatbrook indicates healthy biotic communities. One station, Flatbrook at Walpack Center showed moderate impairment in the most recent assessment (1994). In contrast, earlier biomonitoring assessments in 1993 revealed non-impaired conditions. The reasons behind this change are not yet known. See

the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed.

POINT SOURCE ASSESSMENT

A limited number of point sources are present in the Flat Brook watershed. Some have had impacts to local water quality.

The following wastewater treatment plant permit violation has been mitigated, resulting in water quality improvements:

FACILITY	LOCATION	RECEIVING STREAM	COMMENTS
NJ Dept. of Corrections Mountainview-Stokes Youth Correctional Facility	Montague Twp., Sussex Co.	trib to Big Flat Brook	Facility had discharged treated sanitary wastewater. Discharges were required to cease in 1988. Since 1992, all wastewater generated at the facility has been hauled offsite. The DEP is currently reviewing the permit renewal application for a discharge to groundwater.

NONPOINT SOURCE ASSESSMENT

The waters of the Flat Brook watershed are among the least polluted in the state. The conversion of summer homes to year-round dwellings has resulted in some local nonpoint source contamination from home and road construction, suburban runoff and septic system leachate. Only Little Flat Brook was noted as receiving some minor agricultural runoff.

DESIGNATED USE ASSESSMENT

The Flat Brook as monitored near Flatbrookville does support primary contact recreation. Almost all monitored waters within the Flat Brook watershed fully support the aquatic life designated use, based upon biological monitoring. One station located by Rt. 615 near the Walpack center indicated partial support when sampled in 1994. Previous sampling in 1993 suggested full support. Two stations on Clove Brook, within the neighboring watershed, were found to be moderately impaired.

PAULINS KILL

WATERSHED DESCRIPTION

The Paulins Kill drains an area of 172 square miles, of which 110 square miles are in Sussex County and 62 square miles are in Warren County. This 39 mile long river runs through western Sussex and northern Warren Counties to the Delaware River at Columbia. Newton and Blairstown are the most developed centers of this rural area, but there is development along Route 15. Major tributaries to the Paulins Kill include Yards Creek, Trout Brook, Blair Creek, Morses Brook, and Culver Brook. Impoundments include Paulins Kill Lake, Swartswood Lake, Little Swartswood Lake, Culvers Lake, and Lake Owassa.

The land use in this watershed is primarily agricultural and forested, but there are increasing amounts of developed suburban and commercial lands. There are approximately 10 NJPDES permitted discharges, of which roughly half are municipal and half are industrial/commercial. The stream classifications for the Paulins Kill and tributaries have been identified as FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

The Paulins Kill is monitored for physical/chemical parameters at Blairstown, located in the lower watershed, and at Balesville above Paulins Kill Lake. See the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed.

WATER QUALITY ASSESSMENT

Physical/Chemical Water Quality

Location: Paulins Kill at Balesville and at Blairstown

Nutrients: Water quality of the Paulins Kill remains relatively stable with regard to nutrients. There are more phosphorus violations at Balesville (25%) than at Blairstown (5%) because the presence of an impoundment near the upstream station requires a more restrictive phosphorus criteria at Balesville (0.05 mg/L as compared to 0.10 mg/L at the downstream station). Both locations had similar median values and distributions.

Temperature: Blairstown temperatures exceeded the upper level for trout maintenance waters in 35% of the recorded values. In contrast, 15% of the temperature values recorded at the upstream Balesville station exceeded the upper criterion.

pH: One violation of the upper pH criterion was observed at Blairstown (8.7 in August of 1993).

Paulins Kill at Balesville and at Blairstown continued:

Bacteria: Blairstown exhibits mild elevations of the fecal coliform bacteria. Geometric mean is 96 MPN/100ml, but 15% of samples exceeded the 400 MPN/100 ml criterion. At Balesville, sanitary conditions are unacceptable; the geometric mean of fecal coliform bacteria is 440 MPN/100 ml.

Summary: Water quality in the Paulins Kill ranges from fair quality to good. In general, phosphorus levels are good to marginal. Note that there are more phosphorus violations at Balesville (25%) than at Blairstown (5%) because the presence of an impoundment near the upstream (Balesville) station requires a more restrictive phosphorus criteria (0.05 mg/L as compared to 0.10 mg/L employed at Blairstown). Instream temperatures tend to run warm for trout maintenance waters; elevated water temperatures are more of a problem at Blairstown than upstream at Balesville. At Balesville bacterial counts were notably higher than downstream at Blairstown where sanitary quality runs good to marginal. Other water quality parameters including DO, ammonia, nitrogen and heavy metals are all at acceptable levels.

Current water quality conditions are similar to those encountered during the last assessment using data from 1986 through 1990. The one exception lies in an apparent reduction in phosphorus which seems to have occurred at the Balesville monitoring location.

Biological Monitoring

Biological monitoring in the Paulins Kill itself indicated overall healthy biological conditions. Two locations, however, at Warbasse and below Paulins Kill Lake, indicated moderately impaired conditions. All other remaining locations on the mainstem of the stream were nonimpaired (see the Biological Assessment Table located at the end of this section). Biological impairment was evident in other streams within this watershed. Several unnamed tributaries to the Paulins Kill, as well as Culvers Creek, portions of Troy Brook, Blair Creek and Yards Creek, exhibited moderately to severely impaired macroinvertebrate communities.

POINT SOURCE ASSESSMENT

The Upper Paulins Kill, from Newton to Paulins Kill Lake, had in the past been significantly impacted by the Newton sewage treatment facility which had been discharging inadequately treated effluent into Moores Brook. Previous modeling analyses had estimated that up to 95 percent of the nutrient loading in the Upper Paulins Kill was from this facility. Under an ACO, the facility has upgraded in the early 1990s and no longer impairs water quality as it once did.

NONPOINT SOURCE ASSESSMENT

The Paulins Kill watershed has been assessed and found to be experiencing runoff associated with rapid suburban land development. Housing construction site runoff, suburban surface runoff, as well as heavy winter road salting, are all suspected to be a problem. This is coupled with a decline

in agricultural runoff from crop production. Nonpoint sources have caused eutrophication in many of the lakes in this watershed, including Swartswood Lake.

DESIGNATED USE ASSESSMENT

The Paulins Kill does not support primary contact recreation at the upstream site at Balesville. The stream partially supports the use downstream at Blairstown.

Portions of the Paulins Kill appear to be supporting the "aquatic life support" designated use, while some limited portions partially support the use. Some stress to cold water fishlife (trout and smallmouth bass populations) from high water temperature in summer months may be occurring. Increased residential and commercial development forecasted for the watershed will most likely impact water quality.

PEQUEST RIVER

WATERSHED DESCRIPTION

The Pequest River drainage basin is 158 square miles. The river itself is 32 miles long and flows from southern Sussex County southwest through Warren County to the Delaware River, downstream of Belvidere. The major tributaries to the Pequest include Trout Brook, Beaver Brook, Furnace Brook, and Bear Creek. While there are many small lakes and ponds in the watershed, there are no major impoundments on the Pequest River.

The Pequest River watershed contains many recreational areas, with land use being heavily forested and agricultural. As with the other watersheds in the northwestern section of the State, residential and commercial development is intensifying. There are approximately 9 NJPDES permitted discharges here, of which about one-third are municipal and two-thirds are commercial/industrial. The water quality classifications are FW-2 Trout Maintenance and FW-2 Nontrout, except for the waterways within the Whittingham Tract, which are classified FW-2 Trout Production.

The Pequest River is monitored for physical/chemical parameters at the town of Pequest, located in the lower watershed. See the Biological Assessment Table located at the end of this section for locations of macroinvertebrate assessments within the watershed.

WATER QUALITY ASSESSMENT

Physical/Chemical Water Quality

Location: Pequest River at Pequest

Nutrients: Excessive total phosphorus is observed; one third of all samples exceeded the criteria of 0.10 mg/L. Nitrate plus nitrite, although at acceptable levels, are somewhat elevated, with a median value of 1.24 mg/l.

Bacteria: Fecal coliform levels are marginal; the geometric mean is 198 MPN/100 ml, with 22% of samples exceeding 400 MPN/100 ml.

pH: One violation of the upper criterion occurred in August of 1992.

Other: Chloride levels are somewhat elevated at the Pequest monitoring station; median value for the period assessed was 29 mg/l.

Summary: Overall water quality of the Pequest at Pequest is good. The Pequest River in the lower watershed is a cool, fast moving stream with numerous riffles. Therefore, oxygen reaeration results in sufficient in-stream dissolved oxygen levels during critical periods. Moderately elevated nutrients and bacteria are problematic. Current conditions closely resemble those observed during the last review period when data from 1986 through 1990 were assessed.

Biological Monitoring

Macroinvertebrate assessments indicate the Pequest mainstem to be nonimpaired throughout much of its length. The one exception is at Springdale off Rt. 206 where the community was observed to be moderately impaired. Most tributary stations are also nonimpaired, however, Trout Brook at Rt. 612 appears to undergo periodic moderate impairment, and Mountain Lake Brook below Mountain Lake is also moderately impaired. Furnace Brook at Oxford is severely impaired.

POINT SOURCE ASSESSMENT

Point sources to the Pequest River watershed are thought to be limited, however, some have in the past caused water quality impairment.

The following wastewater treatment plant has been upgraded and/or expanded and has renewed operation:

FACILITY	LOCATION	RECEIVING STREAM	COMMENTS
Oxford Textiles, Inc.	Oxford Twp., Warren Co.	Furnace Brook via Cat Swamp	Discharge of process wastewater contained BOD and acute toxicity violations. Facility has implemented production and disinfection changes to achieve permit compliance.

NONPOINT SOURCE ASSESSMENT

The Pequest has been reported to be impacted by the suburban development occurring throughout the watershed. Back in the late 1980s, the Natural Resource Conservation Service had identified the Pequest system as having serious sheet and soil erosion rates. In the upper half, pollution from agricultural activities such as runoff from crop lands and animal holdings was believed to be on the decline, being replaced with increasing effects of housing construction, suburban runoff, and heavy winter road salting. The overall result has been a combination of nutrient enrichment, pesticide and sediment loading, flooding, and elevated chloride levels in the stream. Nonpoint source pollution in the lower half of the Pequest is known to arise principally from housing construction activities. The most degraded section of the Pequest is reported to be in the Vienna-Great Meadows area where channelization has resulted in complete habitat destruction. Many tributaries in the watershed which support healthy fisheries do receive some minor agricultural runoff; two such streams are Andover Junction Brook and Beaver Brook.

DESIGNATED USE ASSESSMENT

The Lower Pequest is considered partially swimmable. The Pequest River contains both Trout Maintenance and Nontrout waters. Large portions of the watershed appear to fully support the aquatic life support designated use. Three locations (see Biological Monitoring above) partially support the use and one location does not support the use.

POHATCONG CREEK

WATERSHED DESCRIPTION

The 28 mile long Pohatcong Creek stretches from Independence Township to the Delaware River south of Phillipsburg. It drains a 57 square mile area of southwestern Warren County. The population in this area is centered in the Boroughs of Alpha and Washington. Major tributaries include Brass Castle Creek, Shabbecong Creek, and Merrill Creek. The only notable impoundment in the watershed is the Roaring Rock Brook Reservoir, although a reservoir for low-flow augmentation in the Delaware River is being constructed on Merrill Creek.

The land use in this watershed is predominantly agricultural. There are approximately 6 NJPDES permitted discharges here, half of which are municipal and half are commercial/industrial. Pohatcong Creek and its tributaries are classified as FW-2 Trout Production and FW-2 Trout Maintenance. Pohatcong Creek is monitored at New Village for determination of physical/chemical water quality conditions.

WATER QUALITY ASSESSMENT

Physical/Chemical Water Quality

Location: Pohatcong Creek at New Village

Dissolved Oxygen: Acceptable.

Temperature: Elevated: 10% exceeded upper limit for Trout Maintenance waters.

Nutrients: Phosphorus is elevated; violations occurred in 33 % of samples taken during the period of assessment. Median is 0.21 mg/l. Nitrate+Nitrite is also somewhat elevated, median being 1.24 mg/l.

pH: One violation of upper criterion.

Bacteria: Elevated: Fecal coliform geometric mean was 427 MPN/100 ml, with 55% of samples over 400 MPN/100 ml. Location fails to support swimming.

Summary: Current monitoring indicates moderate nutrient enrichment, high in-stream temperatures and excessive bacteria. Current conditions are an improvement over what was observed in 1992. Phosphorus violations are more than half of what they were then and although stream temperatures can still be elevated, unionized ammonia levels seem currently to be within acceptable levels.

Biological Assessment

Macroinvertebrate assessments indicate the Pohatcong to have moderately impaired communities in the upper half (with the exception of the uppermost station that was nonimpaired). The downstream half is nonimpaired. A portion of Merrill Creek in Harmony Township was observed to be moderately impaired. An intensive survey of Pohatcong Creek conducted in 1984 found elevated lead, manganese and nickel in fish tissue. The potential source of the metals was not identified. See the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed.

POINT SOURCE ASSESSMENT

Pohatcong Creek and tributaries drain a predominantly agricultural area with one population center, Washington Borough in Warren County. The creek is fairly small and it appears from the water quality data that it cannot assimilate the pollution loads that drain into the stream.

NONPOINT SOURCE ASSESSMENT

Pohatcong Creek is believed to be impacted by agricultural runoff from croplands and chicken farms. In the recent past, the Pohatcong Creek watershed had been known to have among the highest soil erosion rates in the state. Intensive suburban development has occurred, fueled by one acre zoning. Housing construction, urban surface runoff, plus runoff from storm sewers are all suspected to be contributing to local flooding and local declines in water quality.

As in the Pohatcong Creek, Lopatcong Creek has been impacted by suburban development within the watershed, receiving quantities of urban surface runoff and storm sewer outflow. These are suspected to have caused some water quality degradation as well as flooding. New residential and commercial development in many areas of the watershed may contribute additional runoff problems.

DESIGNATED USE ASSESSMENT

The Pohatcong Creek at New Village will not support the primary contact designated use because of high fecal coliform levels. The upper half of the Pohatcong (with the exception of the uppermost station) partially supports the aquatic life support designated use. The downstream half fully supports the use. Portions of Merrill Creek in Harmony township also partially support the use.

MUSCONETCONG RIVER

WATERSHED DESCRIPTION

The Musconetcong River drains an area of about 156 square miles. It is 42 miles long, stretching from its headwaters at Lake Hopatcong to the Delaware River at Riegelsville. Parts of Sussex, Warren, Hunterdon, and Morris Counties are in the Musconetcong drainage basin. The Upper and Lower Musconetcong comprise the entire watershed. The population centers in this watershed are the towns of Hackettstown, Mt. Olive, and Stanhope. There has also been significant development along the shores of Lakes Hopatcong and Musconetcong. The two major tributaries to the Musconetcong River are Lubbers Run and Beaver Brook. Major impoundments include Lake Hopatcong (the largest lake in New Jersey), Lake Shawnee, Lake Musconetcong, and Cranberry Reservoir.

Aside from the aforementioned developed areas, the rest of the watershed is mostly forests or used for agriculture, although significant development pressures are occurring. The waters of the Musconetcong and tributaries are classified, at various locations, as FW-1, FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout. The Musconetcong River is heavily stocked and utilized by fishermen.

WATER QUALITY ASSESSMENT

Physical/Chemical Water Quality

Location: Musconetcong at Beattystown, Bloomsbury and Riegelsville.

Dissolved Oxygen: Acceptable at all three stations

Temperature: Elevated at all three locations: 7% exceeded upper limit for Trout Maintenance waters at Beattystown. Downstream at Bloomsbury and Riegelsville, 11% and 10% of temperature recordings were in violation of the limit.

Nutrients; Phosphorus is slightly elevated at Beattystown and Bloomsbury. At Beattystown, violations occurred in 11% of samples taken during the period of assessment (median = 0.055 mg/l). At Bloomsbury, 17% of samples were in violation (median = 0.035 mg/l). No violations were observed at the downstream-most location at Riegelsville.

Nitrate+Nitrite medians increased as one proceeds downstream. Median values were 0.99 mg/l, 1.76 mg/l and 1.86 at Beattystown, Bloomsbury and Riegelsville, respectively.

Musconetcong continued

pH: Twenty-two percent violate upper criterion of 8.5 at Beattystown. Eleven percent were in violation at Bloomsbury. No violations were observed at Riegelsville.

Bacteria: At Beattystown, fecal coliform geometric mean was marginal, with 143 MPN and 33% of samples exceeding the 400 MPN/100ml criterion. Downstream at Bloomsbury, levels increase to unacceptable levels, with a geometric mean of 400 MPN/100ml. At Riegelsville the geometric mean was 209 MPN/100ml, representing marginally unacceptable conditions.

Heavy Metals: At Beattystown, one of four copper samples exceeded the chronic criterion for this metal. No violations were recorded at the other two locations.

Un-ionized Ammonia: At Beattystown, three of twenty samples exceeded the criterion for ammonia toxicity of 20 ug/l. No violations were recorded at the other two locations.

Summary: Elevated summertime temperatures are problematic at all three monitoring locations. Nutrients are somewhat elevated, notably phosphorus in the central portion of the river. Bacterial levels range from marginal (Riegelsville and Beattystown) to unacceptable (Bloomsbury). Of particular concern are the exceedances of copper and unionized ammonia observed at Beattystown.

Biological Assessment:
The Musconetcong River itself has a mix of both nonimpaired and moderately impaired stations in the upper half of the river. The lower half appears to be nonimpaired. The quality the tributaries to the Musconetcong also varied. Wills Brook appeared to be moderately impaired; Trout Brook, and Mine Brook were nonimpaired. Lubbers Run had sections reflecting both moderate as well as non-impairment. See the Biological Assessment Table located at the end of this section for details regarding macroinvertebrate assessments within the watershed.

POINT SOURCE ASSESSMENT

Three permitted facilities are currently on record as being in violation of their discharge permit (see below).

Current status of permitted wastewater discharges within the Watershed that were reported to be in noncompliance with their discharge permits:

FACILITY	LOCATION	RECEIVING WATER	POLLUTANT	COMMENTS
Diamond Hill Estates STP	Mansfield Twp., Warren Co.	Hances Brook	Violations of effluent limits for DO, BOD, Suspended Solids, Residual Chlorine, Oil & Grease, and Ammonia.	Effluent limitations are repeatedly violated in spite of escalating enforcement actions.
Mountainview Youth Correctional Institution	Mountainview	Beaver Brook	Violations of effluent limits for BOD5, TKN, total residual chorine, and fecal coliform.	Treatment plant sanitary discharge has frequent effluent violations. An upgraded surface water discharge facility became operational in December 1996 pursuant to an ACO. Compliance with effluent limits has improved, with some ACO issues still pending.
National Auto Truckstops, Inc.	Bloomsbury Borough, Hunterdon Co.	Musconetcong River	Violations of COD and total suspended solids.	Discharge of treated stormwater runoff has shown frequent violations of effluent limits. An ACO was executed in August 1996 to memorialize a compliance schedule.

The following wastewater treatment plant has been upgraded and/or expanded and has renewed operation:

FACILITY	LOCATION	RECEIVING STREAM	COMMENTS
Mt. Arlington Sanitation Corp.	Morris Co.	Lake Hopatcong	Facility formerly discharged treated sanitary wastewater. Plant ceased discharge on Sept. 1994.

NONPOINT SOURCE ASSESSMENT

The upper reaches of the Musconetcong are believed to be receiving increasing amounts of pollution as a result of areawide suburban development. Moderate to severe urban runoff and runoff from construction activities are suspected as causing a decline in stream water quality and an increase in lake eutrophication in the late 1980s. Heavy winter road salting is also an areawide problem. Increasing runoff from urban surfaces and from storm sewers has been singled out as a problem in the Hackettstown area. In the lower reaches of the Musconetcong, chemical and bacterial contamination from agricultural crop production and pasture land are on the decline. In contrast, siltation and erosion from construction activities, nutrients and bacteria from septic systems, as well as road salt, and oil and grease from highway runoff are all reported to be on the increase.

Willis Brook, in addition to point sources, also suffers from the impacts of construction, urban runoff, road runoff, and channelization. They are all assessed to be at severe and ever growing levels. These have brought about flooding as well as a decline in water quality. Mine Brook likewise suffers from water quality and flooding problems brought about by growing levels of construction, highway maintenance runoff, and channelization. Mine Brook additionally receives agricultural runoff from animal holdings, crop land, and

pasture land, all of which appear to be on the decline. The runoff arising from the increasing amounts of housing construction activity in the areas around Trout Brook is believed to be a significant threat to the Hackettstown fish hatchery, as pointed out by local officials. In addition, this brook has experienced fish kills in the past caused by industrial pollution.

Among the lakes evaluated, Lake Shawnee in Morris County is impacted by increasing housing construction. Lake Musconetcong suffers from advanced eutrophication linked to a wide range of nonpoint pollution sources. Known sources include runoff from housing and road construction, and runoff from road and suburban surfaces. A severe problem with septic system leachate has been singled out by local authorities. Well maintained retention basins is a suggested solution made by local authorities. Lake Hopatcong is also reported to receive local fuel spills and leaks which have been suspected in fish kills.

DESIGNATED USE ASSESSMENT

Based upon bacterial data, the Musconetcong partially supports primary contact recreation at Beattystown but will not support the use at either Riegelsville or Bloomsbury. Portions of the upper half of the river both fully support and partially support the aquatic life designated use, while the lower half of the river fully supports this use.

BIOLOGICAL ASSESSMENT TABLE: AREA 1

Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
1	AN0001	Clove Bk	off Rt 23	Montague Twp	Jan 7, 1993	moderately impaired
1	AN0002	Clove Bk	Rt 23	Duttonville	Jan 7, 1993	moderately impaired
1	AN0003	Shimers Bk	Rt 521	Millville	Jan 6, 1993	non-impaired
4	AN0004	Ltl Flat Bk	Deckertown Tnpk (Rt 650)	Four Cors	Jan 7, 1993	non-impaired
4	AN0004	Ltl Flat Bk	Deckertown Tnpk (Rt 650)	Four Cors	Jul 13, 1993	non-impaired
4	AN0004	Ltl Flat Bk	Deckertown Tnpk (Rt 650)	Four Cors	Oct 26, 1993	non-impaired
4	AN0004	Ltl Flat Bk	Deckertown Tnpk (Rt 650)	Four Cors	Apr 19, 1994	non-impaired
4	AN0005	Ltl Flat Bk	Degroat Rd	Hainesville	Jan 6, 1993	non-impaired
4	AN005A	Ltl Flat Bk	Rt 615	Sandyston Twp	Jul 13, 1993	non-impaired
4	AN005A	Ltl Flat Bk	Rt 615	Sandyston Twp	Oct 26, 1993	non-impaired
4	AN005A	Ltl Flat Bk	Rt 615	Sandyston Twp	Feb 2, 1994	non-impaired
4	AN005A	Ltl Flat Bk	Rt 615	Sandyston Twp	Apr 20, 1994	non-impaired
4	AN0006	Bg Flat Bk	Rt 521	Tuttles Cor	Jan 6, 1993	non-impaired
4	AN0006	Bg Flat Bk	Rt 521	Tuttles Cor	Jul 13, 1993	non-impaired
4	AN0006	Bg Flat Bk	Rt 521	Tuttles Cor	Oct 26, 1993	non-impaired
4	AN0006	Bg Flat Bk	Rt 521	Tuttles Cor	Apr 19, 1994	non-impaired
4	AN0007	Flat Bk	Rt 615	Walpack Center	Jan 6, 1993	non-impaired
4	AN0007	Flat Bk	Rt 615	Walpack Center	Jul 13, 1993	non-impaired
4	AN0007	Flat Bk	Rt 615	Walpack Center	Oct 26, 1993	non-impaired
4	AN0007	Flat Bk	Rt 615	Walpack Center	Apr 20, 1994	moderately impaired
4	AN0008	Flat Bk	Rt 615	Flatbrookville	Nov 16, 1992	non-impaired
4	AN0008	Flat Bk	Rt 615	Flatbrookville	Jul 13, 1993	non-impaired
4	AN0008	Flat Bk	Rt 615	Flatbrookville	Oct 26, 1993	non-impaired
4	AN0008	Flat Bk	Rt 615	Flatbrookville	Apr 20, 1994	non-impaired
4	AN0008	Flat Bk	Rt 615	Flatbrookville	Jan 13, 1995	non-impaired

BIOLOGICAL ASSESSMENT TABLE: AREA 1 contin.

Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
10	AN0009	Van Campens Bk	Flatbrookville - Middleville Rd	Walpack Twp	Nov 16, 1992	non-impaired
10	AN0011	Van Campens Bk	Old Mine Rd	Pahaquarry Twp	Nov 16, 1992	non-impaired
10	AN0012	Dunfield Ck	River Rd (off Rt 80)	Pahaquarry Twp	Nov 16, 1992	non-impaired
6	AN0014	Paulins Kill trib	Rt 623	W of Sparta Jnct	Oct 14, 1992	moderately impaired
6	AN0015	Paulins Kill	Rt 663	Warbasse	Oct 14, 1992	moderately impaired
6	AN0016	Paulins Kill trib	Lafayette Meadows Rd	Lafayette Twp	Aug 8, 1984	moderately impaired
6	AN0016	Paulins Kill trib	Lafayette Meadows Rd	Lafayette Twp	Oct 14, 1992	non-impaired
6	AN016A	Paulins Kill trib	Rt 94 & Old Beaver Run Rd	Lafayette Twp	Aug 7, 1984	moderately impaired
6	AN0017	Culvers Ck	Rt 206	Frankford Twp	Oct 13, 1992	moderately impaired
6	AN0018	Culvers Ck	Long Bridge Rd	Frankford Twp	Oct 13, 1992	moderately impaired
6	AN0019	Dry Bk	Rt 519	Frankford Twp	Oct 13, 1992	non-impaired
6	AN0020	Dry Bk	Mill Rd	Branchville	Oct 13, 1992	non-impaired
6	AN0021	Paulins Kill	Rt 626	Balesville	Oct 14, 1992	non-impaired
6	AN021A	Paulins Kill trib	Van Sickle Rd	Lafayette Twp	Aug 8, 1984	moderately impaired
6	AN021B	Paulins Kill	behind Municipal Bldg	Lafayette	Aug 7, 1984	non-impaired
6	AN021C	Paulins Kill	Rt 661	Lafayette Twp	Aug 8, 1984	non-impaired
6	AN0022	Paulins Kill	blw Paulins Kill Lk	Stillwater Twp	Oct 30, 1992	moderately impaired
6	AN0023	Troy Bk	blw Swartswood Lk	Stillwater Twp	Aug 3, 1988	non-impaired
6	AN0023	Troy Bk	blw Swartswood Lk	Stillwater Twp	Oct 30, 1992	moderately impaired
6	AN0024	Trout Bk	Pond Bk Rd (Rt 612)	Middleville	Oct 30, 1992	non-impaired
6	AN0025	Paulins Kill	USGS gage	Blairstown	Nov 9, 1992	non-impaired
6	AN025A	Blair Ck	blw Fairview Lk	Hardwick Twp	Aug 7, 1991	non-impaired
6	AN025A	Blair Ck	blw Fairview Lk	Hardwick Twp	Oct 22, 1991	non-impaired
6	AN025A	Blair Ck	blw Fairview Lk	Hardwick Twp	Jan 13, 1992	moderately impaired
6	AN025A	Blair Ck	blw Fairview Lk	Hardwick Twp	Apr 7, 1992	severely impaired
6	AN0026	Blair Ck	Shannon Rd	Hardwick Twp	Oct 30, 1992	non-impaired
6	AN0027	Blair Ck	Rt 94	Blairstown	Nov 9, 1992	moderately impaired

BIOLOGICAL ASSESSMENT TABLE: AREA 1 contin.

Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
6	AN0028	Jacksonburg Ck	Rt 602	Hardwick Twp	Nov 9, 1992	non-impaired
6	AN0029	Jacksonburg Ck	Rt 94	Jacksonburg	Nov 9, 1992	non-impaired
6	AN0030	Yards Ck	Mt Vernon Rd	Mt Vernon	Oct 11, 1992	moderately impaired
6	AN0031	Yards Ck	Rt 94	Hainesburg	Nov 10, 1992	non-impaired
6	AN0032	Paulins Kill	Rt 46	Columbia	Nov 10, 1992	non-impaired
20	AN0033	Delawanna Ck	Rt 46	Delaware	Nov 10, 1992	non-impaired
20	AN0034	Ramseysburg Ck	Rt 46	Ramseysburg	Nov 10, 1992	non-impaired
15	AN0035	Pequest R	Rt 206	Springdale	Sep 15, 1992	moderately impaired
15	AN0036	Pequest R trib	Brighton Rd	Brighton	Sep 15, 1992	non-impaired
15	AN0037	Pequest R	Pequest Rd	Huntsville	Sep 15, 1992	non-impaired
15	AN0038	Trout Bk	Rt 612	Allamuchy	Sep 15, 1992	moderately impaired
15	AN0038	Trout Bk	Rt 612	Allamuchy	Dec 7, 1992	non-impaired
15	AN0038	Trout Bk	Rt 612	Allamuchy	Mar 25, 1993	non-impaired
15	AN0038	Trout Bk	Rt 612	Allamuchy	Jun 2, 1993	moderately impaired
15	AN0039	Pequest R	Rt 615	Long Bridge	Sep 15, 1992	non-impaired
15	AN0040	Bear Ck	nr Alphano	Independence Twp	Sep 16, 1992	non-impaired
15	AN0041	Pequest R	Cemetery Rd	Vienna	Sep 16, 1992	non-impaired
15	AN0042	Furnace Bk	Pequest Rd	Oxford	Oct 8, 1992	severely impaired
15	AN0043	Pequest R	Pequest Rd	Pequest	Oct 8, 1992	non-impaired
15	AN0044	Mtn Lk Bk	blw Mtn Lk	Liberty Twp	Oct 8, 1992	moderately impaired
15	AN0045	Beaver Bk	abv Silver Lk	N of Hope	Sep 16, 1992	non-impaired
15	AN0046	Honey Run	Rt 519	Hope Twp	Sep 16, 1992	non-impaired
15	AN0047	Beaver Bk	Sarepta Rd	Sarepta	Oct 8, 1992	non-impaired
15	AN0048	Pequest R	Water St	Belvidere	Oct 8, 1992	non-impaired
26	AN0049	Pophandusing Bk	off Rt 519	Belvidere	Oct 8, 1992	non-impaired
26	AN0050	Buckhorn Ck	Hutchinson Sta Rd	Hutchinson	Oct 8, 1992	non-impaired
26	AN0051	Lopatcong Ck	Montana Mt Rd	Allens Mills	Sep 1, 1992	non-impaired

BIOLOGICAL ASSESSMENT TABLE: AREA 1 contin.

Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
26	AN051A	Lopatcong Ck	Hartman Dr nr Fiddlers Elbow Rd	Harmony Twp	Jul 31, 1984	non-impaired
26	AN0052	Lopatcong Ck	Rt 57	Port Warren	Sep 1, 1992	non-impaired
26	AN052A	Lopatcong Ck	Belview Rd	Harmony Twp	Jul 31, 1984	non-impaired
26	AN0053	Lopatcong Ck	Old Rt 22	Alpha	Jul 31, 1984	non-impaired
26	AN0053	Lopatcong Ck	Old Rt 22	Alpha	Sep 1, 1992	moderately impaired
25	AN0054	Pohatcong Ck	Janes Chapel Rd	nr Mt Bethel	Aug 31, 1992	non-impaired
25	AN054A	Pohatcong Ck	O'Brian Rd	Mansfield Twp	Aug 1, 1984	moderately impaired
25	AN0055	Pohatcong Ck	Tunnel Hill Rd	Washington Twp	Aug 31, 1992	moderately impaired
25	AN0056	Brass Castle Ck	Brass Castle Rd	Washington	Sep 1, 1992	non-impaired
25	AN0057	Pohatcong Ck	Buttermilk Bridge Rd	Pleasant Valley	Aug 31, 1992	moderately impaired
25	AN057A	Pohatcong Ck	Rt 31	Washington Twp	Aug 1, 1984	non-impaired
25	AN0058	Pohatcong Ck	Edison Rd	New Village	Aug 31, 1992	non-impaired
25	AN0059	Merrill Ck	Merrill Ck Rd (abv res)	Harmony Twp	Aug 31, 1992	moderately impaired
25	AN0060	Merrill Ck	Farm Rd	blw Stewartsville	Aug 31, 1992	non-impaired
25	AN0061	Pohatcong Ck	Carpentersville Rd	Carpentersville	Sep 1, 1992	non-impaired
25	AN061A	Pohatcong Ck	Ck Rd	Pohatcong Twp	Aug 2, 1984	non-impaired
25	AN061B	Pohatcong Ck	Still Valley Rd	Pohatcong Twp	Aug 2, 1984	non-impaired
25	AN061C	Pohatcong Ck	Willow Grove Rd	Franklin Twp	Aug 1, 1984	non-impaired
16	AN0062	Musconetcong R	blw Lk Hopatcong	Roxbury Twp	Jun 2, 1980	moderately impaired
16	AN0062	Musconetcong R	blw Lk Hopatcong	Roxbury Twp	Jun 17, 1980	moderately impaired
16	AN0062	Musconetcong R	blw Lk Hopatcong	Roxbury Twp	Jul 7, 1980	moderately impaired
16	AN0062	Musconetcong R	blw Lk Hopatcong	Roxbury Twp	Aug 4, 1992	moderately impaired
16	AN0063	Musconetcong R	blw Lk Musconetcong	Stanhope	Aug 4, 1992	moderately impaired
16	AN063A	Musconetcong R	Rt 206	Netcong	Jun 2, 1980	moderately impaired
16	AN063A	Musconetcong R	Rt 206	Netcong	Jun 17, 1980	moderately impaired
16	AN063A	Musconetcong R	Rt 206	Netcong	Jul 7, 1980	moderately impaired

BIOLOGICAL ASSESSMENT TABLE: AREA 1 contin.

Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
16	AN0064	Musconetcong R	off Rt 604 (abv Lubbers Run)	Lockwood	Aug 4, 1992	non-impaired
16	AN064A	Musconetcong R	Glen Bk St	Mt Olive Twp	Jun 2, 1980	non-impaired
16	AN064A	Musconetcong R	Glen Bk St	Mt Olive Twp	Jun 17, 1980	non-impaired
16	AN064A	Musconetcong R	Glen Bk St	Mt Olive Twp	Jul 7, 1980	non-impaired
16	AN064B	Wills Bk	Erie Lackawanna RR Bridge	Mt Olive Twp	Jun 2, 1980	moderately impaired
16	AN064B	Wills Bk	Erie Lackawanna RR Bridge	Mt Olive Twp	Jun 17, 1980	moderately impaired
16	AN064B	Wills Bk	Erie Lackawanna RR Bridge	Mt Olive Twp	Jul 7, 1980	moderately impaired
16	AN064C	Wills Bk	Acorn St	Mt Olive Twp	Jun 2, 1980	moderately impaired
16	AN064C	Wills Bk	Acorn St	Mt Olive Twp	Jun 17, 1980	moderately impaired
16	AN064C	Wills Bk	Acorn St	Mt Olive Twp	Jul 7, 1980	moderately impaired
16	AN0065	Lubbers Run	Rt 607	Hopatcong	Aug 4, 1992	non-impaired
16	AN0066	Lubbers Run	Rt 206	Lockwood	Aug 4, 1992	non-impaired
16	AN0067	Mine Bk	Rt 517	Mansfield Twp	Aug 5, 1992	non-impaired
16	AN0068	Trout Bk	Rt 57	Hackettstown	Aug 5, 1992	non-impaired
16	AN0069	Musconetcong R	Kings Hwy	Beattystown	Aug 5, 1992	non-impaired
16	AN069A	Lubbers Run	Waterloo Rd (N of Rt 604)	Byram Twp	Jun 2, 1980	moderately impaired
16	AN069A	Lubbers Run	Waterloo Rd (N of Rt 604)	Byram Twp	Jun 18, 1980	moderately impaired
16	AN069A	Lubbers Run	Waterloo Rd (N of Rt 604)	Byram Twp	Jul 7, 1980	moderately impaired
16	AN069B	Musconetcong R	off Rt 604 (blw Lubbers Run)	Lockwood	Jun 2, 1980	moderately impaired
16	AN069B	Musconetcong R	off Rt 604 (blw Lubbers Run)	Lockwood	Jun 17, 1980	moderately impaired
16	AN069B	Musconetcong R	off Rt 604 (blw Lubbers Run)	Lockwood	Jul 7, 1980	moderately impaired
16	AN069C	Musconetcong R	blw Waterloo Village lwr dam	Mt Olive Twp	Jun 18, 1980	moderately impaired
16	AN069C	Musconetcong R	blw Waterloo Village lwr dam	Mt Olive Twp	Jul 9, 1980	moderately impaired
16	AN069D	Musconetcong R	S of Rt 604 & Rt 80	Mt Olive Twp	Jun 18, 1980	moderately impaired
16	AN069D	Musconetcong R	S of Rt 604 & Rt 80	Mt Olive Twp	Jul 9, 1980	moderately impaired

16	AN069E	Musconetcong R	Rt 604 (abv Saxton Lk)	Mt Olive Twp	Jun 3, 1980	moderately impaired
16	AN069E	Musconetcong R	Rt 604 (abv Saxton Lk)	Mt Olive Twp	Jun 18, 1980	moderately impaired

BIOLOGICAL ASSESSMENT TABLE: AREA 1 contin.

Watershd	Site ID	Water Body	Location	Municipality	Sample Date	Biological Impairment Rating
16	AN069E	Musconetcong R	Rt 604 (abv Saxton Lk)	Mt Olive Twp	Jul 9, 1980	moderately impaired
16	AN069F	Musconetcong R trib	Rt 604 (blw Deer Pk Pd)	Allamuchy Twp	Jun 3, 1980	non-impaired
16	AN069F	Musconetcong R trib	Rt 604 (blw Deer Pk Pd)	Allamuchy Twp	Jun 18, 1980	non-impaired
16	AN069F	Musconetcong R trib	Rt 604 (blw Deer Pk Pd)	Allamuchy Twp	Jul 7, 1980	non-impaired
16	AN069G	Musconetcong R	Rt 604 (blw Saxton Falls)	Allamuchy Twp	Jun 3, 1980	non-impaired
16	AN069G	Musconetcong R	Rt 604 (blw Saxton Falls)	Allamuchy Twp	Jun 18, 1980	non-impaired
16	AN069G	Musconetcong R	Rt 604 (blw Saxton Falls)	Allamuchy Twp	Jul 9, 1980	non-impaired
16	AN0070	Hances Bk	Rt 57	Beattystown	Aug 5, 1992	moderately impaired
16	AN0071	Musconetcong R trib	Rt 57	Penwell	Aug 11, 1992	non-impaired
16	AN0071	Musconetcong R trib	Rt 57	Penwell	Nov 18, 1992	non-impaired
16	AN0071	Musconetcong R trib	Rt 57	Penwell	Feb 22, 1993	non-impaired
16	AN0071	Musconetcong R trib	Rt 57	Penwell	May 12, 1993	non-impaired
16	AN0072	Musconetcong R	New Hampton Rd	New Hampton	Aug 5, 1992	non-impaired
16	AN0073	Musconetcong R	Rt 579	Bloomsbury	Aug 11, 1992	non-impaired
16	AN0073	Musconetcong R	Rt 579	Bloomsbury	Nov 18, 1992	non-impaired
16	AN0073	Musconetcong R	Rt 579	Bloomsbury	Feb 22, 1993	non-impaired
16	AN0073	Musconetcong R	Rt 579	Bloomsbury	May 12, 1993	non-impaired
16	AN0074	Musconetcong R	River Rd	Reigelsville	Aug 11, 1992	non-impaired